DOCUMENT RESUME

ED 127 568 CS 002 883

AUTHOR Guthrie, John T.; And Others
TITLE A Study of the Locus and Nature of Reading Problems in the Elementary School. Section II. Final Report.
INSTITUTION International Reading Association, Newark, Del.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.,
PUB DATE 30 Jun 76
CONTRACT 400-75-0062
NOTE 79p.; See related document CS 002 882

EDRS PRICE MF-$0.83 HC-$4.67 Plus Postage.
DESCRIPTORS *Compensatory Education; Elementary Education; *Reading Achievement; *Reading Difficulty; *Reading Instruction; Reading Research; *Success Factors

ABSTRACT

Data gathered by the Educational Testing Service from 57,694 children in 264 schools were reanalyzed using the instructional group as the unit of analysis. Second-grade and sixth-grade children were tested in the fall and spring with the Metropolitan Achievement Test and either the Cooperative Primary Test or the Sequential Test of Educational Progress. Questionnaires were used to gather information about demographic characteristics, organization and implementation of programs, educational attitudes, pupil characteristics, and classroom activities. The data were analyzed using separate four-factor analyses of variance (sex by SES by instructional time by instructional emphasis) for each grade and program type. Results indicated that time spent in formal reading instruction was most strongly associated with gains in reading achievement. Instructional emphasis had less impact than instructional time, although in second-grade compensatory programs low instructional emphasis on skills combined with a maximum amount of time produced larger comprehension gains than did high emphasis on skills combined with maximum instructional time. Considered apart from instructional characteristics, sex and socioeconomic level did not influence gains in achievement. (AA)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED127568

U S DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

A STUDY OF THE LOCUS AND NATURE OF READING PROBLEMS IN THE ELEMENTARY SCHOOL

FINAL REPORT

John T. Guthrie, S. Jay Samuels, Victor Martuza

Mary Seifert, S. Jane Tyler, Glenace Edwall

SECTION II

Contractor: International Reading Association
Newark, Delaware
Contract No.: 400-75-0062
Issuing Office: National Institute of Education
Date Submitted: June 30, 1976

CS 002 823

TABLE OF CONTENTS

SECTION I

Page

School Characteristics: Qualities of Schools that are Associated with Reading Achievement

Achievement and Failure in Learning to Read: The Search for Schooling Effects, Program Characteristics and Implementation Strategies 1

Program Characteristics of Successful Reading Programs 20

An Overview of the Research Literature on Educational Innovation 33

Characteristics of Compensatory Readers: Aspects of Reading not Learned by Low Achievers 107

References 132

Tables and Figures

SECTION II

Instructional Impacts on Reading 1

References 45

Tables

INSTRUCTIONAL IMPACTS ON READING

John T. Guthrie
International Reading Association

Victor Martuza
University of Delaware

Mary Seifert
International Reading Association

In elementary schools in the United States, reading instruction is a universal phenomenon. In nearly every school, teachers attempt to help children acquire fundamental reading processes and proficient reading practices. To a greater or lesser degree, teachers engage children in certain activities, the sole purpose of which is to teach them how to read. Yet we also know that at least some children can acquire reading proficiency without formal instruction. As Durkin has documented, a few children learn how to read before entering school (1966). In addition, as this report later points out, some schools commit such a small amount of time and resources to formal reading instruction that children who learn how to read must do so incidentally rather than by intention.

The basic issues of this study revolve around deceptively simple questions. Do children need formal reading instruction to learn how to read? If so, how much instruction is beneficial and what kinds of instructional emphases are most effective? Do some types of children benefit more from reading instruction than other types; and particularly, does instruction benefit low achievers in reading? This problem is not without previous investigation. However, results from former surveys,

exemplary programs, and remedial efforts that have been presented in the first section of this report will not be reiterated here. It should be sufficient to note that too little is known about the conditions of instruction that are needed for optimal reading acquisition. The specific environmental events that can be planned and occasioned by teachers and others that will increase reading ability have not been fully identified. Furthermore, the naturally occurring variations in reading instruction as they appear in classrooms and schools have not been closely studied for their impacts on reading achievement.

The specific questions to which this study is addressed are: 1) to what degree do characteristics of reading instruction programs, such as emphasis on skills, emphasis on language, or amount of instructional time, influence achievement of pupils? 2) To what degree are these effects dependent on previous achievement, chronological age, socioeconomic status, reading level, and sex of the students?

The instructional variables that were chosen for investigation fall into two categories: instructional time and instructional emphasis. The value of exposure to instruction in education has recently been highlighted by Wiley and Harnischfeger (1974). In a reanalysis of Coleman's equality of educational opportunity survey, Wiley and Harnischfeger found that, controlling for socioeconomic status, exposure to instruction in terms of hours of schooling per year is highly related to achievement. They reported that "in schools where students received 24% more schooling, they will increase their average gain in reading comprehension by two-thirds." (p. 9) Notwithstanding the facts that this account seems to exaggerate the impact of exposure to instruction, and that

Karweit (1976) failed to replicate this analysis, the findings seem reasonable. A model is presented by these authors (Wiley and Harnischfeger, 1974) that suggests that achievement is determined by 1)total time needed for a student to learn a task and 2) the total time the pupil spends learning the task. Support for this model in a study of reading instruction is reported by Harris and Serwer (1966). In twelve schools containing primarily disadvantaged children in New York City, Harris and Serwer found that the amount of time devoted to reading activities correlated .56 with achievement in word recognition and .55 with achievement in comprehension for first-grade children. Reading activities included work in basal readers, experience charts, sight-word drill and phonics activities. Supportive activities, such as writing, art, discussion, and dramatization, did not correlate significantly with achievement. Apparently, instruction must be targetted to reading related activities if it is to influence reading achievement. Exposure to instruction-like activities has been related to achievement by Ball and Bogatz in an evaluation of Sesame Street. They reported that disadvantaged children who viewed Sesame Street frequently (more than five times a week) showed more gain in achievement during one year than middle-class children who viewed Sesame Street less often (two to three times a week) (1973). Although frequency of viewing Sesame Street increased achievement for both middle-class and disadvantaged children, quantity of instruction by this measure was more influential than socioeconomic background in facilitating cognitive growth that is relevant to education. In view of these effects, amount of time was selected as one instructional variable for investigation in the present study.

A second instructional variable that was selected was instructional emphasis. The largest single study of reading instruction known as the first-grade studies (Bond and Dykstra, 1967) is difficult to interpret. However, some conclusions may be drawn tentatively based on decision rules that are developed for interpretation of the results. First, we examined the word reading and paragraph meaning subtests of the Stanford Achievement Test as the dependent variables. Second, analyses of variance were ignored and only the analyses of covariance were examined. We decided that if a given contrast, for example, between basal and a phonics/linguistic method, was significant on both analyses of covariance, it was reliable. Third, we looked for contrasts that did not vary across the different sites in the study or varied in the same direction across sites (ordinal interactions were accepted).

Using these guidelines, we concluded that children learned word recognition (SAT word reading) more readily by skills methods such as linguistics or phonics/linguistics than basal methods. Word recognition was also taught efficiently by a combination of phonics and basal in comparison to traditional basal approaches. Reading comprehension (SAT paragraph meaning) was not reliably facilitated by any one procedure except that adding a small skills component such as phonics or phonics/linguistics to a basal program in which considerable language stimulation is provided in terms of basal stories seemed to have an edge in effectiveness. Since an emphasis on decoding seemed beneficial, at least for word recognition, and a reasonable comparison can be made with an emphasis on language, we selected instructional emphases on skills and language for inclusion.

Source of Evidence

The Data Base. This study consists of a reanalysis of data collected by Educational Testing Service under a contract titled, "A Descriptive and Analytic Study of Compensatory Reading Programs." In Phase I of the ETS study, a national sample of schools with compensatory reading programs was constructed and a second sample of schools without Title I compensatory programs was identified. Both of these samples totalled 731 schools, and were reported to be representative of the population of schools in the United States in terms of: average income, percent minority, geographic region, degree of urbanization, and school size. Thus, the findings from the present study are considered to be projectable on a national basis. A subsample of 264 schools was drawn from the original population of 731 schools. The latter sample was given performance tests in reading achievement and attitudes. Questionnaires were filled out by the principals and teachers of regular and compensatory programs. These instruments are described in a later section of this report (Rubin, Trismen, Wilder and Yates, 1973).

The present study was based on the Phase II data of the ETS study that consists of information from 264 schools on 57,694 children. From this data base, the sampling unit that we elected to use was an instructional group in reading. Many analyses of the effects of education are conducted at the school level. However, instructional variables are likely to differ from teacher to teacher and program to program within a given school. Consequently, the analysis of instructional conditions, unlike the analysis of organizational or administrative characteristics, should occur at the program rather than the school level. One might choose the individual child as the sampling unit. However, reading programs are seldom planned and implemented for the individual child.

Instruction is provided in groups, although a substantial amount of individualization may sometimes occur. Therefore, we decided that a group of children designated by the school principal and teacher as the recipients of a **distinct** program should be the unit of analysis.

The data received from ETS on Phase II of their study were culled for quality. Information that was inconsistent or incomplete was eliminated from the data base. Explicitly, attendance records on each instructional group were used. Children were included only if they attended the instructional group to which they were assigned on 75% or more of the required meetings of the group. Children were eliminated from the sample if they did not have both Fall and Spring test scores on all of the tests and subtests that were administered to their age and reading level groups. Instructional groups were omitted from the data base in a few cases in which the questionnaire filled out by the teacher was not matched to the instructional group. An instructional unit was omitted if the information on socioeconomic level, instructional time, instructional emphasis on skills, or instructional emphasis on language was omitted from the questionnaire that was filled out by the teacher.

The original ETS sample had four categories of reading instruction: 1) compensatory only - consisted exclusively of children who were assigned to a reading group "because they were reading below their grade level." 2) compensatory mixed - a group of children who were behind in reading and also children who were normal in reading achievement and who received a reading program; 3) regular only - normally achieving children who received a distinct program; 4) regular mixed - a group of children with some regular and some compensatory readers who received a reading program.

Groups 1 and 3 and 4 were used for the present analysis. The initial ETS sample included samples of second, fourth and sixth-grade children. For purposes of economy, the second and sixth-grade levels were selected for analysis in this survey. Instructional units that received a moderate amount of instructional time as defined in a later section were excluded in favor of units receiving maximum or minimum instructional time. After these exclusions there remained 931 sampling units that constituted our data base. The numbers of children included: compensatory second, 1086; regular second, 2833; compensatory sixth, 884; regular sixth, 3282; total 8085. To determine whether the sample after exclusions was similar to the original group of 63,000 children, we compared scores on all measures that were used in the analyses of covariance. The raw score means differed by less than one point except for three instances, 1.38, 1.45, 1.35. These negligible differences lead us to believe that the exclusions did not produce any bias in the sample.

Achievement Tests. In the ETS study, reading tests were administered to the sample of 264 schools in the Fall of 1972 and the Spring of 1973. The tests included all of the items that are listed in Table 1 titled, "Tests Administered as Part of the Study of Compensatory Reading Programs." In the Fall, 1972, second grade groups received the Cooperative Primary Test, Form 12A, the Metropolitan Achievement Test, Primary 1, Form G. In the Spring, the second grade received the Cooperative Primary Test, Form 12B, and the Metropolitan Achievement Test, Primary 1, Form F. The sixth grade groups in the Fall, 1972, received the Metropolitan Achievement Test, Elementary Battery, Form G, and the Sequential Test of Educational Progress Series II, Form 4A. In the Spring, the sixth grade

groups received the Metropolitan Achievement Test, Elementary, Form F and Sequential Test of Educational Progress, Series II, Form 4B. The Metropolitan Achievement Tests always included the Word Knowledge and Reading subtests. For both grade levels 2 and 6, at both time periods, Fall and Spring, a measure of attitudes toward reading was administered. However, since the results from this test will not be reported in this study, further discussion of this measure will be omitted. The tests were administered by classroom teachers with the supervision of Educational Testing Service staff. The materials provided to students were specially prepared booklets and answer sheets at the second grade level, while the normal forms and materials were used for sixth graders. The tests were scored, coded and the scores were transposed by Educational Testing Service.

Questionnaires. The questionnaires consisted of four units. A school principal questionnaire contained forty-nine items and elicited information about the school populations, the organization and implementation of programs, and other school level information. A teacher characteristics questionnaire was filled out by each teacher in the study. It contained sixteen items including demographic training and belief characteristics. A modest inventory of seventeen items was included regarding teachers' beliefs about compensatory reading children and programs. A regular class and program characteristics questionnaire was filled out by teachers. It contained forty-five items including the specification of goals, pupil characteristics and classroom activities. A compensatory class and program characteristics questionnaire was filled out by each teacher that had a compensatory instructional group. This questionnaire

included forty-nine items very similar to the items on the regular class and program characteristics questionnaire that elicited information about teaching goals, pupil characteristics and classroom activities.

Socioeconomic Status. From these questionnaires were selected items that were used for analysis in the investigation. From the regular and compensatory program questionnaires an item was selected that reflects the socioeconomic status of the instructional groups. This item is represented as Table 2 and titled "Item Describing Socioeconomic Status of Instructional Groups from Class and Program Characteristics Questionnaire." After perusing several questionnaires, we developed a numerical system for combining the occupational categories and the percentages of occurence. The numbers in parentheses were our coding system. For all responses to the item the vertical number was multipled by the horizontal number and the products were summed for a final score for the instructional group. For example, if a teacher placed an X in the category "11-50%" skilled workers or farm workers, .3 was multipled by 70; that equals 21. If the teacher also filled in the column 51-90% for unskilled or service workers, .7 was multiplied by 100, which is 70. These two numbers sum to 91, which was categorized as low socioeconomic status. The scale for this item runs from 1 - 100, representing high to low socioeconomic status.

The distribution of socioeconomic status in reading groups was examined with a broad population. Children from the initial ETS sample, including second, fourth and sixth graders in the four different instructional group categories previously described, were included. Excluded were those children or instructional groups in which there were incomplete

or inconsistent data as specified previously. Results of this analysis are displayed in Table 3 entitled, "Distribution of Socioeconomic Status Among Regular and Compensatory, Second, Fourth and Sixth Grade Instructional Groups." The scale from 0-100 is divided into ten categories: 1-9, 10-19, 20-29, . . . 90-100. This distribution divides approximately into quarters. The first three intervals: 1-9, 10-19, 20-29, constitute the first 27.2% of the distribution. We designated this as high SES. The next four intervals include the next 47.7% of the population which we designated as middle SES. The last three intervals include 25.1% of the population which we designated as low SES.

To determine whether the socioeconomic distribution within grade level and reading level categories was sufficient to permit analysis, the distribution was partitioned as shown in Table 4, entitled "Frequency of Instructional Groups According to SES and Reading Level at Second and Sixth Grades." From this table it is apparent that within second grade compensatory programs the percentages of sampling units in the SES categories were as follows: high SES, 15%; middle SES, 45.8%; low SES, 39.2%. In other words, there are sufficient number of high SES sampling units to allow inclusion of this category in the statistical analyses for second grade compensatory programs. Similar conclusions can be drawn about the sixth grade compensatory programs and regular programs at both grade levels. It may be noted that there is a relatively low proportion of low SES children in regular sixth grade programs.

Instructional Time. The variable of instructional time was based on an item from the class and program characteristics questionnaire by that name. The item may be viewed in Table 5 entitled, "Item for Instructional Time from Class and Program Characteristics Questionnaire."

Teachers described their programs in terms of minutes per period and periods per week. We multiplied these to obtain a figure of minutes per week. On the table, the numbers in parentheses represent the mid-points in the intervals used on the questionnaire. Range in time is from eight to six hundred (or more) minutes per week of formal instructional time. We divided this into ten minute intervals and examined the allocation of instructional time. Table 6, containing these results is entitled, "Distribution of Instructional Time for Formal Reading Instruction in Regular and Compensatory Programs." It should be noted that the data base for this distributional analysis is the same as the data base for the SES distributional analysis. The allocation of instructional time to reading groups contains more variation than one might have supposed. The bottom 22.6% (approximately one quarter) contained eighty minutes per week or less of formal reading instruction. About two-thirds of this bottom group received thirty-one to forty minutes per week of instruction, which is to say an average of about six to eight minutes a day. At this point we have not analyzed the scheduling of this time over the course of a week. That is, forty minutes may appear in two twenty-minute periods or four ten-minute periods. Further analysis is necessary to make these distinctions. The upper quarter of the distribution (25.3% of the instructional group) consists of 221 - 600 minutes per week. About half of these units received 221 - 230 minutes per week, which is 45 minutes per day of reading instruction.

These descriptions were based on the entire distribution of regular and compensatory second, fourth and sixth graders. As Table 6 indicates, distribution of time in compensatory programs is remarkably

similar. That is, 22.4% of the instructional groups received eighty minutes per week or less, and 26.1% of the instructional groups received 221 minutes per week or more of formal reading instruction. In other words, the amount of reading instruction and exposure for children varies noticeably in this sample which is presumably representative of variation in public schools.

Instructional Emphasis. The independent variable of instructional emphasis included a skills orientation. The degree to which skills were taught in a regular or compensatory reading program was determined from a combination of four items from the class and program characteristics questionnaire. These items are represented in Table 7 entitled, "Items from the Class and Program Characteristics Questionnaire Representing Skills Emphasis." These items were identical for compensatory and regular program questionnaires. On the table, the numbers in parentheses indicate the value that was assigned to different responses for each item. For example, in the first item, if a teacher stated that she organized her reading groups around specific skill deficiencies often, she was provided with credit for skill emphasis. If she indicated that she used this organizational scheme sometimes, rarely or never, she was given no credit for skill emphasis. The score for each instructional unit on these four items was summed and ranged from 0-4, representing low to high skill emphasis. The distributions of skill emphasis in compensatory and regular programs are presented in Tables 8 and 9. In attempting to maximize the number of instructional units in each of the grade level and reading level subgroups, we have decided to designate scores of 0 - 2 as low instructional emphasis on skills, and scores of 3 and 4 as high instructional emphasis on skills.

These tables reveal that emphasis on skills decreased markedly from second to sixth grade. The emphasis, on the other hand, is about the same for compensatory and regular programs at second grade, and is similar for compensatory and regular programs at sixth grade. There is slightly, but not dramatically, more skill-oriented instruction in compensatory than regular reading programs.

The emphasis on language during instruction was also drawn from four items on the class and program characteristics questionnaires. These items were scored in a manner analogous to the items related to skills and are represented in Table 10 entitled, "Items from the Class and Program Characteristics Questionnaire Representing Language Emphasis." The range was low emphasis, 0, to high emphasis, 4. However, since most teachers recorded that they emphasized language substantially, we designated 4 as a high language emphasis, and 0-3 as a low language emphasis to establish a sufficient number of instructional groups in each of the grade level and reading level categories to permit analysis. Tables 11 and 12 entitled, "Distribution of Language Emphasis in Compensatory (and Regular) Programs at Grades Two and Six" illustrate the frequency of emphasizing language.

Comparing these two tables illustrates that a high degree of language emphasis seems equally apparent at regular and compensatory second grade programs. However, at sixth grade, the regular programs contained a high degree of emphasis, but sixth grade compensatory programs contained lower emphasis on language. More explicitly, within compensatory programs, 57.4% of the second grade programs placed high emphasis on language, whereas in sixth grade 35.1% placed high emphasis on language.

Thus, emphasis on language in reading programs is high, except for the case of compensatory programs in sixth grade.

Statistical Analyses

Design. The easiest way to understand the design is to examine Table 13 entitled, "Design for Analyses of Covariance for Instructional and Pupil Characteristics on Reading Achievement." Pupil characteristics are represented in the columns and instructional characteristics are represented in the rows. The instructional emphasis variable, as it is listed in the table, pertains to skills. The instructional emphasis on language is also entered in this category in an analogous manner. That is, high and low language was included under both minimum and maximum instructional times. A number of analyses of covariance were conducted. For example, one analysis of covariance was conducted for compensatory readers in second grade. The analysis included all of the cells listed under these two headings in the table. In this analysis, the factors included 2(Sex) x 3(SES) x 2(Instructional time) x 2(Instructional emphasis, skills). The dependent variable was the Spring Metropolitan Word Knowledge score and the covariate was the Fall Metropolitan Word Knowledge score for each instructional group. Analogous analyses of covariance were conducted for compensatory readers at sixth grade, regular readers at second grade, and regular readers at sixth grade. With this design it is apparent that the influence of instructional variables of time and emphasis are examined when pupil characteristics including previous achievement, reading level (compensatory vs. regular), grade level, socioeconomic status and sex are controlled. The number of sampling units included in these sets of analyses are: compensatory-

second, 118; compensatory-sixth, 96; regular-second, 365; and regular-sixth, 352.

Rationale. In recent years there has been considerable controversy concerning the proper method(s) for analyzing change data. At this time, consensus is still lacking. Kenny (1975) and others (e.g., Campbell & Erlebacher, 1971) have stressed the importance of considering the various alternative approaches to analyzing "quasi-experimental" change data in order to minimize the effects of factors like regression and treatment by maturation interaction, especially in the evaluations of compensatory programs which seem to be especially susceptible in this regard. In particular, Kenny suggests that the decision to use (a) analysis of variance (ANOVA) with raw change scores, (b) ANCOVA with standardized gain scores (c) analysis of covariance (ANCOVA); or (d) ANCOVA with reliability correction ought to take into account the manner in which the selection of subjects into the various treatment groups takes place. The concerns of Kenny and others seem to have been motivated primarily by the controversy emanating from past compensatory program evaluations which, for the most part, have indicated that the compensatory treatments, when compared to a nonequivalent control, tend to be ineffective or perhaps detrimental in its effect (e.g., see Campbell & Erlebacher, 1971). Since the analyses in the present study do not involve the types of comparisons upon which their concerns are based (i.e., compensatory treatment vs. noncompensatory control), and because the sampling units are teacher/class means (computed separately for each level of student sex) rather than individual student scores, the effects of factors like those mentioned earlier would appear to be minimal. As a result, two

reasonable approaches to data analysis in the present study are (a) ANOVA using raw change scores and (b) ANCOVA using pretest data. Primarily because of statistical power considerations, the latter was chosen.

In summary, a separate ANCOVA was run on each dependent variable of interest (cell n's were too small to permit multivariate analyses) using pretest data gathered using the same instrument as the covariate within each cell of a compensatory status (i.e., compensatory vs. non-compensatory) by grade level (i.e., 2nd vs. 6th) population stratifications.

We now give some illustrative examples of how these analyses address the issues of the study. It was indicated at the outset that the point of this study is to examine the impact of instructional characteristics in reading programs on achievement in reading. However, such an analysis must include controls for characteristics of students in reading programs that may influence achievement. The most salient of these characteristics were thought to include previous achievements, general reading level, grade level, socioeconomic status, and sex. In addition, it is possible to analyze reading achievement as word recognition or reading comprehension. For these purposes, the Word Knowledge subtest of the Metropolitan Achievement Test and the Reading subtest of the Metropolitan Achievement Test were analyzed separately. From this framework, it is apparent that a 2(sex) x 3(SES) x 2(IT) x 2(Emphasis: skills) analysis of covariance on Spring MAT Word Knowledge scores using Fall MAT Word Knowledge scores as the covariate for second grade compensatory programs will provide a suitable test. This analysis evaluates the impact of instructional time and instructional emphasis on achievement in word knowledge by compensatory children during the course of second grade. The analysis

controls for previous achievement, sex, and socioeconomic level. These tests are listed in Table 14 entitled, "Analyses of Covariance." All analyses of covariance were conducted using the multivariance program prescribed by Finn (1974).

Preconditions. There are several statistical and psychometric preconditions that were thought to be important for interpreting the analyses of covariance. First, if ceiling effects were observed in a certain data set, analyses of covariance were not conducted on that set. This occurred for regular second grade Metropolitan Achievement Tests and regular sixth grade Metropolitan Achievement Test: Word Knowledge. Next are examined the conditions of: 1) comparable pretreatment populations; 2) homogeneity of regression; and 3) adequate cell n. It was thought that these properties of the data should be satisfactory before a significant effect in an analysis of covariance was interpreted confidently.

The precondition of comparable pretreatment populations refers to the degree of correlation between the covariate and the stratification or instructional variables. If equal populations are observed we may rule out a treatment by maturation interaction as a threat to the validity of the inferences. For every statistical test these conditions were examined.

Suppose we wish to evaluate the impact of instructional time, minimum versus maximum time conditions, for second grade compensatory programs on word knowledge. We wish to be certain that the children who are allocated maximum time do not differ in word knowledge achievement scores from children who were allocated minimum instructional time prior to the

occurrence of the treatment. In this case, previous achievement would be confounded with instructional time as a variable that might account for differential gains in the two instructional time conditions. As Tables 15 and 16 show, the condition of comparable populations occurred for the large majority of the analyses of covariance.

The precondition for homogeneity of regression refers to the requirement that the regression slopes for the dependent variable and the covariate be not significantly different across the cells of the analysis of covariance design. Since some of the cells in a number of analyses were empty or had a very small number of sampling units, tests of the parallelism assumptions in each case was based only on cells in which the number of sampling units was three or more.

The preconditions of adequate cell n refers to the need for stability in all of the cells of the analysis of covariance. In several analyses of compensatory program data there were cells with n's that were too low (less than 5) to permit interpretation of higher order interactions with confidence.

These preconditions may be viewed in Tables 15 and 16 that are titled, "Summary of Tests of Preconditions for Analyses of Covariance of Instructional and Pupil Characteristics in Achievement in Compensatory (and Regular) Reading Programs." It is evident that for each cell as defined by grade level, dependent variable and a pupil or an instructional characteristic, there are four letters entered. For example, in grade two Metropolitan Reading-SES, the letters W,X,Y,Z appear. The W stands for the fact that the populations were equal. That is, in second grade compensatory programs, the high, middle and low socioeconomic groups did

not differ significantly in their Fall achievement in the Reading subtest of the Metropolitan Achievement Test. The X indicates that the homogeneity of regression assumption was tenable in the analysis of covariance for this particular effect. The Y refers to the absence of ceiling effects in the Metropolitan Reading subtest for compensatory reading groups at second grade. The Z indicates that the cell n's were sufficiently large to interpret the results confidently. Note that there are two tables, one for compensatory programs and one for regular programs. The analyses of variance that were used to conduct the tests for equal populations are listed in Table 17 by the title of "Analyses of Variance for Precondition of Equal Populations."

As Tables 15 and 16 indicate, a large majority of the conditions were favorable. Exceptions to this include the presence of ceiling effects in the Metropolitan Achievement Test Word Knowledge and Reading subtests for second grade regular programs. The Metropolitan Achievement Test Word Knowledge also evidenced ceiling effects for sixth grade regular instructional groups. One violation of the equal populations precondition occurred for regular sixth grade programs. Low SES children who were in maximum instructional time conditions had lower pretest scores than other groups such as low SES children in minimum time instruction or middle SES children in maximum instruction on the MAT Reading measure. Consequently, these low SES maximum time groups may be expected to make smaller gains than other groups. As a result, their relatively small achievement over the course of the year cannot be easily interpreted.

Procedures. The main purpose of these statistical analyses was to examine the effect of instructional variables on reading achievement.

We wished to examine these effects while controlling for pupil characteristics of socioeconomic status and sex. The analyses of covariance included four factors: socioeconomic status, sex, instructional time, and instructional emphasis. In analyzing balanced data, the order in which these variables are entered does not influence the significance of the outcomes. However, in unbalanced designs such as those in this study, the sum of squares associated with the variable will be larger if it is entered first than if it is entered last. We used a priori rules to establish that the blocking variables of sex and SES should be entered first and the instructional variables of time and emphasis should be entered last, to provide conservative estimates of the effects of the variables of primary concern. The order used for all of the analyses was sex, SES, instructional time, and instructional emphasis. We conducted exploratory reordering of these main effects and found the differences were negligible. Consequently, we assumed that the a priori rules were justifiable. One benefit of this analysis is that it provides a partitioning of the sum of squares which allows the calculation of percentage of variance accounted for by the different effects.

The principal means for reporting the outcomes of the analyses of covariance is the percentage of variance accounted for. The importance of different factors such as instructional time or socioeconomic status will be discussed in terms of the percentage of variance attributable to these factors. Other ways of reporting the results could have been used including gains in raw score units, gains in percentile points or gains in grade equivalent units. The use of raw scores was excluded,

since different tests were used in second and sixth grade with different numbers of items and different scales for the tests. The use of grade equivalent units is limited in value for this study, primarily because two of the tests did not convert to grade equivalent units, Cooperative Primary Test and the Sequential Test of Educational Progress. Another reason is that reports of gains in grade equivalent units must include both means and standard deviations for the different groups that are being described, and often comparisons of the magnitude of effects are difficult. It is expected that the combination of percentage of variance accounted for and changes in percentile scores will be appropriate. The percentile scores are derived from the means of the raw scores of groups.

One of the prime benefits of percentage of variance accounted for as a means of describing results is that it provides an estimation of the strength of association between the independent and dependent variables using the definitions particular to this study. It also allows the descriptive comparison of the effects of instructional variables across age, reading level, socioeconomic status and other characteristics of the students.

Several limits to this approach should also be noted. First, the strength of association that is reflected by the percentage of variance attributable, for example, to instructional time in a given study, may be interpreted only within the limits of the amounts of time used in that study. As Glass and Hakstian (1969) note, a percentage of variance attributable to instructional time or quantity of schooling can never be stretched to refer to a universal relationship between these variables. The relationship is particular to the specific levels and ranges of the dependent and independent variables in the study.

A second caution is that the index used in the present study is one of many indices. We used epsilon squared, which is very similar to omega squared. However, slightly different approximations of strength of association are given by these two formulas. Third, the unequal n analyses that were conducted here yield estimations of the percentage of variance accounted for that are partially a function of the ordering of factors. Due to these limitations, the percentage of variance accounted for reported in this study should be regarded as an approximation of a relationship between two variables; the figures should not be interpreted in an absolute sense.

Results

Instructional Impacts in Compensatory Programs. The outcomes for children in compensatory reading programs will be outlined first. In second grade compensatory reading programs, amount of instructional time had a significant effect on the Word Knowledge subtest of the Metropolitan Achievement Test ($p < .01$). The difference between minimal instructional time, which was about five minutes a day, and maximum instructional time, which was about sixty minutes a day or more, accounted for about 4% of the variance. Children who received maximum time in compensatory reading programs made larger gains than children who received minimum instructional time. See Table 19.

A second effect of instructional variables on children in second grade compensatory reading programs was an interaction between instructional time and instructional emphasis. This effect occurred on the Cooperative Primary Reading Test. This interaction was significant at $p < .03$ and accounted for about 3% of the variance. About one-third of

the items on the Cooperative Primary Test might be said to be primarily measures of word knowledge; however, most of the items require sentence and paragraph comprehension and the measure may be viewed as a test mainly of reading comprehension.

The meaning of the significant interaction is as follows. For compensatory programs in which a high-skill emphasis occurred, amount of instructional time did not influence gains in reading comprehension during the second grade year. However, in programs in which low skill emphasis occurred, amount of instructional time had a distinct impact. Maximum time produced larger gains than minimum time. These results may be viewed in Table 18, entitled, "Percentile Scores on the Cooperative Primary Test of Second Grade Compensatory Groups in Different Instructional Conditions." Under conditions of high skill emphasis, minimal instructional time produced a loss of three percentile points from Fall to Spring. In this condition, maximum instructional time produced a gain of three percentile points from Fall to Spring. Both of these changes may be regarded as minor in magnitude. Under conditions of low instructional emphasis, minimum time produced a gain of three percentile points, but maximum time produced a larger gain of eleven percentile points. In other words, the conditions of low skill emphasis and maximum time combined to produce larger gains in comprehension than any of the other combinations of instructional variables.

For sixth grade compensatory reading programs, instructional time was found to have a significant effect on reading comprehension as measured by the Sequential Test of Educational Progress. This effect was significant at $p < .03$ and accounted for about 3% of the variance.

However, interpretation of this effect is not clear, since instructional time interacted with socioeconomic status on the Sequential Test of Educational Progress. In other words, the effects of time do not occur similarly across different socioeconomic levels. As the table reveals, the interaction of instructional time and socioeconomic status accounted for 8% of the variance on the STEP test, ($p < .01$). In brief, this effect suggests that more instructional time had a beneficial effect on children of low socioeconomic status, but this benefit did not occur for children in middle and high socioeconomic levels.

One view of this interaction may be obtained by considering changes in percentile scores. (Table 20) For low SES children who received minimum instructional time in compensatory programs, there was no change in their raw score from Fall to Spring and this represents a loss of six percentile points. For low SES children in maximum instructional time, a considerable gain in raw score points was observed, but it was not sufficient to increase their percentile points; they lost two percentiles. Thus, while low SES children in compensatory programs tend to lose ground on their peers, maximum instructional time tends to reduce the loss and is consequently beneficial, at least relative to minimum instructional time. On the contrary, middle and high SES children who received minimum instructional time in compensatory programs, gained a considerable number of raw score points and a few percentile points, three percentiles for high SES and four percentiles for middle SES. On maximum instructional time, both groups made smaller raw score gains and lost percentile points. They both lost five percentile points. This suggests that smaller gains in reading comprehension

were made under conditions of maximum time than under conditions of minimum time for middle and high SES children. If this effect is replicable, it warrants further research. Several plausible hypotheses could be developed to account for this result and should be examined in future investigations.

A significant interaction between instructional time and socioeconomic level was also observed for the Word Knowledge subtest of the Metropolitan Achievement Test. This effect was significant at $p < .005$ and accounted for 9% of the variance. The interaction is very similar to the one described in a previous paragraph. Parallel to their performance in reading comprehension, low SES children benefited from more instructional time in their acquisition of word recognition. Under conditions of minimum instructional time, low SES children made negligible progress, but under conditions of maximum instructional time, low SES children made substantial gains on the Word Knowledge subtest. For middle SES children, on the other hand, maximum instructional time produced slightly smaller gains than minimum instructional time. One puzzling outcome of this analysis was that high SES children performed more like low SES than middle SES, showing higher gains in maximum instructional time than minimum instructional time. Quite why this latter effect occurred is not immediately apparent. What is both reasonably clear from the statistical analyses and fairly important for education is that instructional time benefited low SES children at the sixth grade level in both word recognition and comprehension. In contrast, increasing amounts of time did not benefit middle socioeconomic groups and had an inconsistent impact on high SES children.

The relative benefits of compensatory programs for second graders compared to sixth graders may be judged by examining the changes in percentile points that occur in Table 21, "Percentile Scores on COOP and STEP in Regular and Compensatory Programs for Grades Two and Six." The children in second grade compensatory programs gained eleven percentile points, from 16 in the Fall to 27 in the Spring; whereas children in sixth grade lost one percentile point from 22 in the Fall to 21 in the Spring. Apparently, compensatory reading programs had more impact in reading achievement in second than sixth grade.

Instructional Impacts in Regular Programs. Results of the statistical analyses in regular reading programs are presented in a form parallel to those for compensatory reading programs. At second grade, the Metropolitan Word Knowledge and Reading subtests exhibited ceiling effects and consequently, analyses of covariance were not conducted on them. On the Cooperative Test for second graders, there were no significant effects observed.

In sixth grade regular programs, there were a number of significant effects that accounted for relatively small percentages of variance. The effect for sex on Metropolitan Achievement Reading, accounting for 1% of the variance, was that girls had higher gains than boys. However, sex interacted with SES on STEP ($p < .03$), accounting for 1% of the variance. The smallest gains were made by low SES girls and high SES boys; other groups consisting of high SES girls and low SES boys made relatively larger gains. The instructional time by instructional emphasis interaction for the STEP revealed that amount of time made little difference for low skill emphasis. The largest gains were under

the conditions of minimum time-high skill emphasis; the smallest gains occurred for maximum time-high skill emphasis.

The most pronounced effect in the regular programs at sixth grade was an interaction between instructional time and socioeconomic status that accounted for about 3% of the variance ($p < .001$). This effect is attributable to the fact that instructional time influenced low SES but not middle and high SES groups. However, the impact of larger amounts of instructional time on low SES children was negative. Maximum time produced lower gains than minimum time for low SES in comprehension, as measured by the Sequential Test of Educational Progress. These results are more easily understood by examining Table 22, entitled "Percentile Scores on the STEP for Sixth Grade Regular Programs Under Different Instructional Time and SES Categories." For low SES children, it can be observed that minimum instructional time produced a gain of six percentile points; but maximum instructional time produced a loss of nine percentile points for middle and high SES, the changes in percentile points ranged from 0 to +3. It should be noted that the low SES children in minimum instructional time were slightly lower in the Fall percentile points than low SES in maximum instructional time. It should also be noted that this was not a statistically significant difference. Under both conditions of instructional time, low SES have lower achievement entering sixth grade than middle and high SES groups.

One possible reason for this interaction is that if a teacher commits a large amount of time to formal reading instruction and the low SES children in the class are having difficulty coping with the

materials and activities, they learn very little. This may be due to the fact that the instructional demands exceed their capacity for performance and make learning difficult. Likewise, it is possible that low SES children under minimum instructional time may be in a situation where they can direct themselves to materials that are at an appropriate difficulty level and interesting content from which they may learn at least something of reading comprehension.

It may be noted that the interaction between instructional time and socioeconomic status described in the previous paragraph also occurred for the Metropolitan Achievement Test, Reading. However, in this case, the assumption of equal populations was violated. On the pretest the low SES children in maximum time conditions had a lower mean than low SES children in minimum time conditions or middle and high SES children in maximum time conditions. They also showed the least amount of gain from pretest to posttest. Consequently, the low gains of the low SES children in maximum time cannot be attributable either to time or previous achievement taken separately.

Finally, there was a significant interaction between instructional conditions and socioeconomic level on Metropolitan Achievement Test Reading (See Table 23). The degree of emphasis on skills interacted with SES, accounting for 2% of the variance ($p < .009$). This effect may be taken to mean that for low SES children, a high skill emphasis was superior to a low skill emphasis in producing gains in comprehension. However, skill emphasis did not differentially affect middle SES and high SES groups. In this case, as in others, instructional variation appeared to influence achievement of low SES children, but seemed to have less impact on middle and high SES groups. More will be said about this in the discussion section.

Pupil Characteristics. In addition to conducting analyses for the purpose of analyzing the impact of instructional variables on reading achievement, some analyses were completed to describe characteristics of students who are enrolled in compensatory reading programs. One set of analyses was intended to address the cumulative deficit hypothesis in reading. This hypothesis consists of the notion that children who are behind in reading in their early school years fall further and further behind as they progress through school. The hypothesis is often thought to be particularly true for children from low socioeconomic levels. Fundamentally, the hypothesis requires longitudinal data for proper analysis. In this study cross-sectional data only are available and consequently the conclusions are only suggestive. To specify the issue more exactly, we may ask whether children of low SES are further behind children of middle and high SES at sixth grade than at second grade. The same data base that was used in the analyses of covariance was employed for this analysis.

For children from compensatory and regular reading programs combined, percentile scores of the different SES levels do not change noticeably from second to sixth grade. As Table 24 illustrates, high SES groups in second grade had a percentile score of 63 in second grade, which changes to a percentile score of 56 in sixth grade. Middle SES children move from 50th percentile in second grade to 44th percentile at sixth grade. Low SES children are at 30th percentile in second grade and 31st percentile in sixth grade. Consequently, in terms of percentile points in comparison to their peers, low SES children do not experience cumulative deficit between grades two and six.

Another way of addressing this issue is to examine the discrepancy between low achievers and other groups in terms of grade equivalents. In other words, children in compensatory reading programs can be compared to the population in regular programs; and low SES children can be compared to other SES groups (See Table 25). Based on the same data set that was used for the study of instructional impacts, these data may be used to compare compensatory readers to one another.

It is clear that at the beginning of second grade, the mean of children in compensatory reading programs was 1.56 on the Word Knowledge subtest of MAT. Since they should be at a grade equivalent of about 2.0, there is a deficiency of about .44 grade equivalent units. At the beginning of sixth grade, the mean of compensatory readers on the Metropolitan Word Knowledge subtest was 4.1. Since they should be about 6.0, this represents a deficiency of about 1.9 grade equivalents. Clearly, 1.9 grade equivalents, nearly two years, is more than .44 grade equivalents, which is about one-half year. Therefore, in grade equivalent units, the deficiency is higher at sixth grade than second grade.

It should be noted that the means used here are unweighted averages of the means for each SES group present in the table. However, there were different numbers of instructional units in these SES groups. The high SES category had many fewer than the other categories and consequently is weighted more heavily than the others in the mean. The inferences are not affected by this, but the absolute levels of deficiency in grade equivalent terms should be judged separately for each of the SES groups. It may also be noted that the results for comprehension as measured by the Reading subtest of the Metropolitan

Achievement Test are highly similar to the results for the Word Knowledge subtest.

Examining the differences between children from different SES levels within those who are receiving compensatory reading programs produces some interesting relationships. At second grade in both word knowledge and reading, there are no clear distinctions between SES levels in achievement. However, at sixth grade the high SES children are noticeably higher than the others, about one year below national expectation. Middle SES have a grade equivalent of 3.9 that is about two years below expectation. The low SES groups have means of approximately 3.3 and are nearly three years behind expectation as they enter sixth grade.

One way of explicating these relationships is to examine learning rates (See Table 26). This term refers to the ratio between achievement in grade equivalent terms and years spent in school. The formula consists of the grade equivalent in reading minus one, divided by number of years in school. In word knowledge, low SES children in second grade had gained about six-tenths of a year previously. Sixth grade children had gained about five-tenths of a year, although no statistical tests were conducted on these data, a small decline in learning rate from second to sixth grades appeared in word recognition and comprehension for low SES groups. High SES children gained about four-tenths of a year in word knowledge in second grade and about eight-tenths of a year in sixth grade. Their learning rates increased from second to sixth. The pattern of results is similar for comprehension as measured by the reading subtest of the MAT. These findings suggest

that low SES children who were enrolled in compensatory programs in sixth grade had acquired reading skills at a slower rate than children who were enrolled in programs at the second grade level, and the trend is reversed for middle and high SES. From these data, however, we cannot conclude that the rate of learning to read declines since these are cross sectional rather than longitudinal relationships. It is entirely possible that some of the children with higher learning rates in second grade are placed in regular classes and do not appear in programs for compensatory reading at sixth grade. Therefore, the sixth graders would consist of a population that is not comparable to the population in second grade in this data set.

Another characteristic of children in compensatory reading programs that was examined was the relative importance of word recognition and comprehension as reading problems. For this analysis, the data set similar to the one used for analyses of instructional impacts was employed, except that children who received medium amounts of instructional time were added. The basic issue of interest was whether word recognition or reading comprehension are more likely to appear as primary areas of deficiency and whether the main area of deficiency is the same for second and sixth graders.

With this analysis, the word recognition and reading subtests of the Metropolitan Achievement Test were used. Means and standard deviations for second and sixth grade compensatory readers were obtained. For each subtest at each grade level, a score of one standard deviation or more below the mean of the group was regarded as a deficiency. A score of one standard deviation or more above the mean was regarded as

a (relative) proficiency. A score between +1 and -1 standard deviations around the mean was regarded as average. For each child individually, the score on word recognition and reading were examined. If the child was in the average range in word recognition, but in the deficient range in comprehension, he was tallied into a category representing that combination. A layout of all the combinations may be seen in Table 27.

The majority of children had scores that were in the middle range in both subtests. Another 20.6% had scores that were either high on both or low on both subtests. The largest single area of discrepancy was children whose scores were average in comprehension and low in word recognition, constituting 15.6% of all the children. This type of category will be regarded as a word recognition deficiency, since the child's word recognition score was relatively low, whereas his comprehension score was average. It is noteworthy that among second graders extreme discrepancies were rare. Only two-tenths of one percent had scores that were highly discrepant, more than one standard deviation above the mean on one subtest and more than one standard deviation below the mean on the other subtest. Likewise, the pattern for sixth graders is very similar to that for second graders (Table 28). The large majority of scores are similar on both subtests and extremely discrepant scores are very rare.

The data from the two tables presented previously on types of problems among compensatory readers were combined (Table 29). Three categories of deficiency were constructed. A word recognition deficit was said to occur if the child had high comprehension and average word recognition, medium comprehension and low word recognition, or high

comprehension and low word recognition. The comprehension deficit was said to occur if a child had medium recognition and low comprehension, high recognition and medium comprehension, or high recognition and low comprehension. The category of comparable scores was based on the cases where children were similar on both subtests, either high in both, average in both, or low in both. The frequencies of children in these different categories were combined and presented in the form of percentages. It is apparent that in second grade, most children, 68.9%, are similar in both subtests; 17.6% seem to have a word recognition deficit, and 13.5% seem to have a comprehension deficit. In sixth grade, 75.5% are similar in both subtests, 13.1% are said to have a word recognition deficit, and 11.4% are said to have a comprehension deficit.

To characterize the types of problems observed in children in compensatory reading programs, we may first observe that about 70% of the children are comparable in both word recognition and comprehension. However, about 30% of the children seem to have a discrepancy that may merit diagnosis and special instructional programming. About equal numbers of these children have word recognition and comprehension deficiencies, although the former are slightly more common than the latter. These patterns hold for both second and sixth grades. The kinds of problems observed among poor readers do not seem to change radically across the elementary school years. It should be noted that we are describing performances that are based on norm-referenced measures. Most frequently in our data, to say that a child has a word recognition deficiency is to say that he is less capable than his peers in compensatory reading programs at recognizing words, but he is about the same as his peers

in compensatory programs at understanding sentences and paragraphs. We cannot make any statements from these data about performances in an absolute sense. For example, it cannot be inferred from these data that 13.5% of the second graders cannot comprehend written material that they are capable of decoding. Although this notion may be true, it cannot be inferred directly from these data. What can be inferred are relative statements of the kind presented previously that are themselves interesting and that give rise to hypotheses about decoding and comprehension in an absolute sense.

Qualifications. There are several limitations and cautions that should be attached to the findings of this study. A primary limitation is the precision of the independent variables. Instructional time and emphasis were based on teacher self reports and were not verified by independent observers. This may increase random error, but does not likely introduce bias to the study. The items from the questionnaire on which these variables were based were relatively few in number and lacking in detail. With more precise observations of these instructional characteristics, stronger relationships to achievement are likely to be observed.

For both second and sixth grades, there were two tests that provided measures of reading comprehension. In second grade, the Metropolitan Achievement Test Reading and the Cooperative Primary Reading Test were used; and in sixth grade, the Metropolitan Achievement Test Reading and the STEP were included. As you may have noticed, effects of instructional variables were sometimes noted on one measure of comprehension for a given grade, and sometimes on the other measure of comprehension, and in some cases, the effects occurred for both measures.

We do not have an immediate explanation for why an instructional effect should occur on one test of comprehension but not on a different test. From a conservative viewpoint, this indicates that an effect could not be replicated and consequently, should not be seriously regarded. From another perspective, it indicates that comprehension tests may vary in their demands on the children and the nature of the measures and their sensitivity to instructional impacts should be studied closely. It may also be added that while these tests are widely accepted measures of reading, they do not contain a heavy reliance on critical thinking, not do they assess the functional uses of reading nor attitudes toward reading. There are many important goals of reading instruction that are not measured on these tests.

The use of percentage of variance as a primary vehicle for reporting the outcomes seemed to be the most appropriate technique available, but some caveats for this procedure are called for. As indicated previously, any estimate of percentage of variance accounted for by a given independent variable is influenced by the range of values, the distributions of scores, stratification system, and a particular formula used to estimate this statistic. For example, we compared instructional time that represented the upper 25% of the distribution against instructional time that represented the bottom 25% of the distribution. This was justified on the grounds that the two levels that were included, that is, about sixty minutes a day or more, and about five minutes a day or less, are inherently valuable categories that represent distinctly different but realistic variations in instructional programs. Had we stratified this independent variable in a different manner, the percentage of variance that it accounted for might have been slightly different.

We may note that the magnitude of the instructional effects observed in this investigation was moderate. We could account for about 3 - 9% of the variance in reading achievement over the course of one year by instructional characteristics of reading programs. Notwithstanding variance that is attributable to pupil characteristics and error of measurement, there is likely to be room left for the impact of other program characteristics. There are bound to be other instructional qualities that influence achievement. However, the impacts of instructional time as it occurred alone, in combination with instructional emphasis, and in combination with socioeconomic level were noteworthy. It seems that these variables have a place in the psychology of reading instruction and the development of reading programs for the benefit of elementary school children.

Conclusions. At the outset of the study, two major problem areas were posed: 1) to what degree do characteristics of instructional programs, such as emphasis on skills and language or amount of instructional time, influence achievement of pupils? 2) to what degree are these effects dependent upon previous achievement, age, SES, reading level, and sex of the pupils?

Within the constraints of the present investigation, instructional characteristics of reading programs were observed to have an impact on reading achievement. The findings suggest that time in formal reading instruction is an educational variable that is likely to increase achievement in reading.

Maximum instructional time influenced some types of children more than others. Instructional time in formal reading instruction had the greatest impact on children in second grade compensatory programs.

The impact of time on achievement appears to be greater in second than sixth grade, and in compensatory than regular reading programs.

Instructional time seemed to influence low SES children more than middle and high SES children at the sixth grade level. At second grade, the combination of time and SES was not important. Among sixth graders, low SES children benefited from larger amounts of instructional time but time did not have an impact on achievement for middle and high SES groups. While this effect occurred for compensatory programs, a different interaction occurred in regular reading programs. Larger amounts of instructional time had a slightly negative effect on achievement of low SES children, and a negligible impact on middle and high SES groups in regular programs.

The types of instructional emphasis that are provided in reading programs had less impact on achievement than amount of instructional time. However, in second grade compensatory reading programs, low instructional emphasis on skills combined with a maximum amount of time produced larger gains in comprehension than a high instructional emphasis on skills combined with the maximum amount of instructional time.

Pupil characteristics of socioeconomic level and sex did not influence gains over the course of one year. Exceptions to this occurred only in terms of the interactions with program characteristics that were described previously. Considered apart from instructional characteristics, sex and socioeconomic level did not influence gains in achievement over one year. From this investigation it appears that instructional characteristics have more impact than pupil characteristics on reading achievement; and instructional time is more well

invested in children who are relatively young and relatively low in reading achievement than other groups. Among older children, instructional time had substantial impact on low SES groups but did not influence middle and high SES children in reading achievement.

Discussion of Findings

During the past decade many people have held a skeptical view about schools, due partly to the reports of Coleman (1966) and Jencks (1972). After reanalyzing the data from the equality of educational opportunity survey conducted by Coleman, Jencks states in reference to elementary schools that "school effects probably account for only two or three percent of the total variance...in verbal scores" (p. 124). He continues that "no measurable school resource or policy shows a consistent relationship to schools' effectiveness in boosting student relationship between student achievement and such things as school size, class benefits, some show losses, and some no effect either way" (p. 96). His view about the importance of high schools is even more conservative, claiming that the average effect of a high school on its students scores in reading comprehension and math, controlling for SES and educational aspirations, accounts for about .0001 percent of the variance. Appearing in many locations, statements such as these have led too many people to conclude that educational programs have little effect on student achievement.

One criticism that may be raised is that Coleman and Jencks have not analyzed educational programs appropriately. In their approach, school effects are determined by examining achievement across a variety of schools using one school as a unit of analysis. However, a school

is merely a place. The aggregation of teachers, students and materials in that place is primarily an administrative convenience. Educational events that occur within a place such as this are extremely variable and are likely to be critical to achievement. Consequently, the benefits of schools should not be determined on the basis of how schools differ from one another, but rather on how educational events within schools influence the achievement of children who share those events.

The fact that differences between schools account for a relatively small amount of variability in achievement does not imply that what goes on in schools is not important. In the Coleman report, schools are described in terms of such factors as: whether the school has a speech therapist, a librarian, a principal with an M.A. degree or higher, free textbooks, a large library, highly experienced teachers, and so forth. However, none of these factors have any direct concrete bearing on what skills and capabilities children are taught, how children are taught, and what is learned. Instructional events and learning events that are most closely related to educational achievement are not necessarily influenced by these facts. In the present study reading programs within schools were examined. Gains in achievement scores over the course of one year as revealed by the tests administered before and after the occurrence of a program were studied. This contrasts with Coleman and Jencks who analyzed the variables that related to achievement as reflected by one test score administered at one point in time. In addition, Coleman and Jencks refer to achievement at 6th, 9th, and 12th grade, whereas we have examined achievement at 2nd, as well as 6th grade. It is likely that the strongest schooling effects

will appear early in the child's schooling history and will be associated with the teaching program in which he is placed.

One of our findings was that the amount of formal instruction in reading that was given to children in compensatory reading programs at the second grade level accounted for about four percent of the variance in achievement gains over one year. Compensatory reading programs in which 45 minutes per day or more were spent in teaching reading were clearly more effective than programs in which six to seven minutes per day were spent in formal reading instruction. Although this effect appears to be generalizable across our national sample and is likely to be repeatable, the magnitude of the effect seems moderate. The importance of the relationship between instructional time and achievement may be considered from several viewpoints. First, instructional time is one component in a multicomponent system. As reflected in a variety of reports of exemplary reading programs, there are many components of successful program including: strong leadership, clear objectives, structured curricula, individualization of instruction, administrative support, a variety of materials, support personnel, and so forth, as well as the investment of substantial amounts of time in teaching reading. While instructional time is not the only ingredient of a good program, it is clearly one that should not be neglected.

The magnitude of these results may be compared to the analysis of classroom instruction in follow-through programs. In one study of thirty first-grade classrooms it was found that 16% of the variance in reading and math achievement at the end of first grade was explained by classroom process variables, controlling for initial ability (Cooley

& Emrick, 1974). The process variables included: time spent on reading and math, praise and encouragement from the teacher, amount of individual instruction and amount of teacher-pupil interaction. Our finding that 4-9% of the variance in reading achievement was attributable to instructional time is consistent with the study of follow-through since instructional time is approximately one out of four classroom instruction variables that were examined in that investigation.

The impact of instructional time on achievement may also be compared with the impact of socioeconomic status on achievement. We found that socioeconomic status acting alone did not influence gains in reading at second or sixth grade, for regular or compensatory programs. Socioeconomic status had its primary influence by interacting with instructional time for sixth grade compensatory programs. That is, a large amount of instructional time benefited children from low socioeconomic status groups, but did not affect children from middle and high SES groups. In second grade instructional time influenced gains in achievement, but socioeconomic status did not relate to achievement gains. These findings confirmed the observation of Ball and Bogatz that amount of time spent viewing Sesame Street was more important than socioeconomic status in influencing cognitive development in five and six-year-old children. In contrast, Jencks reported that for sixth graders differences in socioeconomic status accounted for about 9% of the variance in achievement scores while differences between schools accounted for about 2-3% of the variance in achievement scores. By his analysis, socioeconomic status plays a bigger part than school in producing reading achievement. However, it should be recognized

that his analysis neglects the important instructional events and fails to examine the early stages of the educational process.

Our finding that amount of instructional time in reading increases reading achievement (under certain conditions) confirms the general model of schooling proposed by Wiley and Harnischfeger (1974). This outcome also validated one feature of many exemplary reading programs, a considerable devotion of time to teaching the basics of reading. It should be recognized that it is not time itself that influenced achievement. It was the events that occurred in time. As Harris and Serwer (1966) have shown, instructional time influences reading achievement only if children are engaged specifically in reading activities. Time that is spent in management, general discussion, or such activities as art that are irrelevant to reading processes do not influence reading achievement.

It is likely that reading achievement is primarily facilitated by the amount of time children spend reading and learning the processes of reading. Probably, there is a high correlation between instructional time in reading and learning time in reading, allowing the relationship between instructional time and achievement to be observed. The relationship between learning time and reading achievement has been documented by several investigators (Samuels & Turnure, 1974; Lahaderne, 1968). Measures were taken of how much time children spent on the tasks assigned by the teacher during reading lessons. These tasks varied from workbooks, basal readers, and word discriminations made by other children. The correlation of these measures of reading achievement and attention to reading tasks were .44 and .51 with initial ability partialed out.

In future examinations of time in reading instruction we should attempt to quantify the cognitive/language events that occur relevant to reading. Right now our best measure of intensity is amount of instructional time and amount of learning time; and intensity is apparently related to the acquisition of reading.

One important outcome of this investigation was that amount of instructional time interacted with socioeconomic status in sixth grade. For compensatory programs, amount of formal instruction in reading increased achievement among low SES groups but did not make a difference for middle and high SES groups. One possible explanation for this result is that the amount of time that middle SES and high SES children spend in reading activities outside of formal instruction is substantial. The amount of time spent reading and learning in formal reading classes is minor by contrast. However, for low SES children the amount of time reading outside of formal lessons is relatively low. Consequently, the necessary interactions between the child and written language, from which complex operations needed for reading may be acquired, occur for low SES children primarily during formal instruction but occur for middle SES children in other circumstances as well. The implication is that the investment of instructional time in reading at the sixth grade level is particularly important for low SES children. Apparently, a primary agent of change in reading for older low-achieving children from lower socioeconomic backgrounds is instruction in reading.

REFERENCES

Ball, S. and Bogatz, G.A., Research on Sesame Street: some implications for compensatory education. In J. Stanley (Ed.), Compensatory education for children, Ages 2 to 8, Baltimore: The Johns Hopkins University Press, 1973.

Bond, G.L. and Dykstra, R. The cooperative research program in first-grade reading. Reading Research Quarterly, 1967, 2 (entire issue).

Campbell, D.T., and Erlebacher, A. How regression artifacts in quasi-experimental evaluations can mistakenly make compensatory education harmful. In J. Hellmuth (Ed.), The disadvantaged child (Vol. 3). New York: Brunner/Mazel, 1971.

Coleman, J.S., et.al. Equality of educational opportunity. Washington: United States Printing Office, 1966.

Cooley, W.W. and Emrick, J.A., A model of classroom differences which explains variation in classroom achievement. Paper presented at the annual meeting of the American Educational Research Association, Chicago, April, 1974.

Durkin, D. Children who read early. New York: Teachers College Press, Columbia University, 1966.

Finn, J.D. A general model for multivariate analysis. New York: Holt, Rinehart and Winston, 1974.

Glass, G.V. and Hakstian, A.R., Measures of association in comparative experiments: Their development and interpretation. American Educational Research Journal, 1969, 6(3), 403-14.

Harris, A. and Serwer, B., The CRAFT Project: Instructional time in reading research. Reading Research Quarterly, 1966, 2(1), 27-57.

Jencks, C. Inequality. New York: Basic Books, 1972.

Karweit, N. Quantity of schooling: A major educational factor? Educational Researcher, 1976, 5(2), 15-17.

Kenny, D.A. A quasi-experimental approach to assessing treatment effects in the nonequivalent control group design. Psychological Bulletin, 1975, 83(3), 345-62.

Lahaderme, H.M. Attitudinal and intellectual correlates of attention: A study of four sixth-grade classrooms. Journal of Educational Psychology, 1968, 59, 320-324.

Samuels, S.J. and Tunure, J.E. Attention and reading achievement in first grade boys and girls. Journal of Educational Psychology, 1974, 66, 29-32.

Wiley, D.E. and Harnischfeger, A. Explosion of a myth: Quantity of schooling and exposure to instruction, major educational vehicles. Educational Researcher, 1974, 3(4), 7-12.

TABLE 1

TESTS ADMINISTERED AS PART OF THE STUDY

OF COMPENSATORY READING PROGRAMS

	Fall, 1972	Spring, 1973
Grade 2	Cooperative Primary Tests, 12A *Metropolitan Achievement Tests Primary I, G Attitudes Toward Reading, Grade 2	Cooperative Primary Tests, 12B *Metropolitan Achievement Tests Primary I, F Attitudes Toward Reading, Grade 2
Grade 4	Cooperative Primary Tests, 23A *Metropolitan Achievement Tests Elementary, G Attitudes Toward Reading, Grades 4 & 6	Cooperative Primary Tests, 23B *Metropolitan Achievement Tests Elementary, F Attitudes Toward Reading, Grades 4 & 6
Grade 6	Sequential Tests of Educational Progress, Series II, 4A *Metropolitan Achievement Tests Elementary, G Attitudes Towards Reading, Grades 4 & 6	Sequential Tests of Educational Progress, Series II, 4B *Metropolitan Achievement Tests Elementary, F Attitudes Toward Reading, Grades 4 & 6

* Word Knowledge and Reading Subtests

TABLE 2

ITEM DESCRIBING SOCIOECONOMIC STATUS OF INSTRUCTIONAL GROUPS FROM CLASS AND PROGRAM CHARACTERISTICS QUESTIONNAIRE

Estimate the percentage of pupils in your compensatory reading class whose family incomes are derived from each of the following occupational categories.

		None	1-10% (.05)	11-50% (.30)	51-90% (.70)	91-100% (.95)
(100)	(a) Unskilled or service workers		___	___	___	___
(70)	(b) Skilled workers or farm owners		___	___	___	___
(30)	(c) White collar workers (clerks, salespeople, etc.)		___	___	___	___
(5)	(d) Business owners or managers		___	___	___	___
(1)	(e) Professionals (doctors, lawyers, etc.)		___	___	___	___
(100)	(f) Unemployed		___	___	___	___
*	(g) Don't know		___	___	___	___

TABLE 3

Distribution of Socioeconomic Status Among Regular and Compensatory

2nd, 4th and 6th grade Instructional Groups

	Socioeconomic Status									
	High			Middle				Low		
Regular and Compensatory	1-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-100
Absolute Frequency (%)	253	239	269	380	266	344	347	189	183	330
Relative Frequency (%)	9.0	8.5	9.6	13.6	9.5	12.3	12.4	6.8	6.5	11.8
Cumulative Frequency(%)	9.0	17.6	27.2	40.7	50.2	62.5	74.9	81.7	88.2	100.0

Note: High SES is generally associated with occupational categories of: white collar workers, business owners or managers and professionals.

Middle SES is generally associated with occupational categories of: white collar and skilled workers.

Low SES is generally associated with occupational categories of: unskilled or service workers or unemployed.

TABLE 4

Frequency of Instructional Groups
According to SES and Reading Level
at Second and Sixth Grades

SES		Second Grade		Sixth Grade		Total Group
		Compensatory	Regular	Compensatory	Regular	
HIGH	Frequency	16	103	10	115	244
	Column Percent	15.0	24.3	11.6	29.2	24.1
MIDDLE	Frequency	49	231	46	213	539
	Column Percent	45.8	54.5	53.5	54.1	53.3
LOW	Frequency	42	90	30	66	228
	Column Percent	39.2	21.2	34.9	16.7	22.6

Note: Column percents are percentages of the cell over the total for its column. The frequency of 16 is 15% of 107, the sum of 16, 49 and 42.

TABLE 5

ITEM FOR INSTRUCTIONAL TIME FROM CLASS

AND PROGRAM CHARACTERISTICS QUESTIONNAIRE

What is the average amount of formal instructional time per student in reading?

a. Minutes per instructional period:

_____ 1 - 15 (8)	_____ 51 - 60 (56)
_____16 - 30 (23)	_____ 61 - 75 (68)
_____31 - 40 (36)	_____ 76 - 90 (83)
_____41 - 50 (46)	_____ 91 or more (100)

b. Number of instruction periods per week:

_____ one (1)	_____ four or five (4)
_____ two or three (2)	_____ more than five (6)

TABLE 6

Distribution of Instructional Time
for Formal Reading Instruction
in Regular and Compensatory
Programs

Regular and Compensatory Combined				Compensatory			
Min./week	Absolute Frequency	Rel. Freq. (%)	Cum. Freq. (%)	Min./week	Absolute Frequency	Rel.Freq. (%)	Cum. Freq. (%)
0 - 10	50	1.8	1.8	0 - 10	29	2.0	2.0
11 - 20	45	1.6	3.4	11 - 20	24	1.6	3.6
21 - 30	1	0.0	3.4	21 - 30	0	0	3.6
31 - 40	396	14.1	17.6	31 - 40	202	13.7	17.3
41 - 50	125	4.5	22.0	41 - 50	66	4.5	21.8
71 - 80	15	0.5	22.6	71 - 80	9	0.6	22.4
91 - 100	522	18.6	41.2	91 - 100	282	19.2	41.6
111-120	15	0.5	41.8	111-120	7	0.5	42.1
131-140	131	4.7	46.4	131-140	63	4.3	46.4
141-150	323	11.5	58.0	141-150	165	11.2	57.6
161-170	6	0.2	58.2	161-170	6	0.4	58.0
181-190	408	14.6	72.8	181-190	205	13.9	71.9
191-200	2	0.1	72.8	191-200	1	0.1	72.0
211-220	53	1.9	74.7	211-220	28	1.9	73.9
221-230	372	13.3	88.0	221-230	191	13.0	86.9
271-280	127	4.5	92.5	271-280	72	4.9	91.8
331-340	93	3.3	95.9	331-340	59	4.0	95.8
391-400	66	2.4	98.2	391-400	36	2.4	98.2
401-410	14	0.5	98.7	401-410	7	0.5	98.7
491-500	13	0.5	99.2	491-500	7	0.5	99.2
501-600	23	0.8	100.0	501-600	12	0.8	100.0

TABLE 7

ITEMS FROM THE CLASS AND PROGRAMS CHARACTERISTICS QUESTIONNAIRE REPRESENTING SKILLS EMPHASIS

A. If your reading class is organized into groups, indicate the frequency with which you organize by the following criteria:

Specific skill deficiencies	Often	Sometimes	Rarely	Never
	(1)	(0)	(0)	(0)

B. How much time does a typical pupil in your compensatory reading class spend in the following:

Phonics and/or structural analysis	A great deal	Some	Little or none
	(1)	(0)	(0)

C. How would you rate the following in terms of importance to you as goals in your current teaching of reading?

Developing a sight vocabulary (whole word recognition)	Major Goal	Secondary Goal	Of little or no importance as a goal
	(1)	(0)	(0)

D. How successful would you consider your teaching of reading to be with respect to the following:

Enhancing pre-reading or reading skills	Highly successful	Moderately successful	Moderately unsuccessful
	(1)	(0)	(0)
	Totally unsuccessful	Not applicable	
	(0)	(0)	

TABLE 8

Distribution of Skill Emphasis

in Compensatory Reading Programs

at Grades 2 and 6

		Skill Emphasis					
		Low 0	1	2	3	High 4	Total
Grade 2	Frequency	4	20	44	42	12	122
	Row %	3.3	16.4	36.1	34.4	9.8	56.5
6	Frequency	11	38	28	15	2	94
	Row %	11.7	40.4	29.8	16.0	2.1	43.5

TABLE 9

Distribution of Skill Emphasis
in Regular Reading Programs at
Grades 2 and 6

Grade		Skill Emphasis Low 0	1	2	3	High 4	Total
2	Frequency	24	91	180	122	36	453
	Row %	5.3	20.1	39.7	26.9	7.9	51.5
6	Frequency	100	150	109	58	9	426
	Row %	23.5	35.2	25.6	13.6	2.1	48.5

TABLE 10

ITEMS FROM THE CLASS AND PROGRAMS CHARACTERISTICS QUESTIONNAIRE REPRESENTING LANGUAGE EMPHASIS

How would you rate each of the following activities in terms of importance to you as goals in your current teaching of reading?

	Major Goal (1)	Secondary Goal (0)	Of little or no importance as a goal (0)
Developing skill in using context clues	___	___	___
Developing comprehension skills	___	___	___
Developing listening skills	___	___	___
Improving verbal communication	___	___	___

TABLE 11

Distribution of Language Emphasis

in Compensatory Programs at

Grades 2 and 6

Grade		Language Emphasis Low 0	1	2	3	High 4	Total
2	Frequency	5	6	10	31	70	122
	Row %	4.1	4.9	8.2	25.4	57.4	56.5
6	Frequency	4	12	21	24	33	94
	Row %	4.3	12.8	22.3	25.5	35.1	43.5

TABLE 12

Distribution of Language Emphasis
in Regular Reading Programs
in Grades 2 and 6

Grade		Language Emphasis Low 0	1	2	3	High 4	Total
2	Frequency	3	15	47	128	260	453
	Row %	0.7	3.3	10.4	28.3	57.4	51.5
6	Frequency	6	19	51	118	232	426
	Row %	1.4	4.5	12.0	27.7	54.5	48.5

TABLE 13

Design for Analyses of Covariance
for Instructional and Pupil Characteristics
on Reading Achievement

Instructional Time	Instructional Emphasis	Compensatory Readers												Regular Readers											
		Second Grade						Sixth Grade						Second Grade						Sixth Grade					
		H. SES		M. SES		L. SES		H. SES		M. SES		L. SES		H. SES		M. SES		L. SES		H. SES		M. SES		L. SES	
		B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G
Minimum Instructional Time	High Skills																								
	Low Skills																								
Maximum Instructional Time	High Skills																								
	Low Skills																								

TABLE 14

Analyses of Covariance

	Factors	Program	Grade	Covariate	Dependent Variable
1.	2(Sex) x 3(SES) x 2(IT) x 2(Emphasis: Skills)	Compensatory	2	Fall MAT Word Knowledge	Spring MAT Word Knowledge
2.	" " " " "	"	"	Fall MAT Reading	Spring MAT Reading
3.	" " " " "	"	"	Fall Cooperative	Spring Cooperative
4.	" " " 2(Emphasis: Lang.)	"	"	Fall MAT Word Knowledge	Spring MAT Word Knowledge
5.	" " " " "	"	"	Fall MAT Reading	Spring MAT Reading
6.	" " " " "	"	"	Fall Cooperative	Spring Cooperative
7.	" " " 2(Emphasis: Skills)	Regular	"	Fall Cooperative	Spring Cooperative
8.	" " " 2(Emphasis: Lang.)	"		Fall Cooperative	Spring Cooperative
9.	" " " 2(Emphasis: Skills)	Compensatory	6	Fall MAT Word Knowledge	Spring MAT Word Knowledge
10.	" " " " "	"	"	Fall MAT Reading	Spring MAT Reading
11.	" " " " "	"	"	Fall Step	Spring Step
12.	" " " 2(Emphasis: Lang.)	"	"	Fall MAT Word Knowledge	Spring MAT Word Knowledge
13.	" " " " "	"	"	Fall MAT Reading	Spring MAT Reading
14.	" " " " "	"	"	Fall Step	Spring Step
15.	" " " 2(Emphasis: Skills)	Regular	"	Fall MAT Reading	Spring MAT Reading
16.	" " " " "	"	"	Fall Step	Spring Step
17.	" " " 2(Emphasis: Lang.)	"	"	Fall MAT Reading	Spring MAT Reading
18.	" " " " "	"	"	Fall Step	Spring Step

TABLE 15

Summary of Tests of Preconditions for Analyses of Covariance of Instructional and Pupil Characteristics on Achievement in Compensatory Reading Programs

	Grade 2			Grade 6		
	MWK	MREAD	COOP	MWK	MREAD	STEP
PUPIL						
SES	a1xyz	wxyz	a2xyz	a3xyz	a5xyz	a5xyz
Sex	wxyz	wxyz	wxyz	wxyz	wxyz	a4xyz
SES x Sex	wxyd	wxyd	wxyd	wxyz	wxyz	wxyz
INSTRUCTION						
Time	wxyz	wxyz	wxyz	wxyz	wxyz	wxyz
Emphasis	wxyz	wxyz	wxyz	a7xyz	a7xyz	a7xyz
IT x Emphasis	wxyz	wxyz	wxyz	wxyd3	a9xyd3	wxyd3
INTERACTION						
IT x SES	wxyd	wxyd	a12xyd	wxyd1	wxyd1	a6xyd1
Emphasis x SES	a11xyd	a11xyd	a11xyd	a10xyd2	a8xyd2	a10xyd2

Are Conditions favorable?

	No	Yes
Comparable populations	a	w
Equal slopes	b	x
Ceiling effect absent	c	y
Adequate Cell n	d	z

TABLE 15 Continued

Summary of Tests of Preconditions for Analyses of Covariance of Instructional and Pupil Characteristics on Achievement in Compensatory Reading Programs

a1 = SES groups differ in achievement: MSES > LSES > HSES

a2 = SES groups differ in achievement: MSES > LSES > HSES

a3 = SES groups differ in achievement: HSES > MSES > LSES

a4 = Girls are higher than boys

a5 = SES groups differ in achievement: HSES > MSES > LSES

a6 = Prescores for maximum IT groups were lower than minimum IT groups for HSES and LSES, but minimum IT was higher than maximum IT for MSES.

a7 = Low skill emphasis had higher prescore than high skill emphasis

a8 = High SES low skills had a higher prescore than other groups.

a9 = High and low skills differ more in maximum IT than minimum IT

a10 = High SES low language had a higher prescore than others; low SES high language had lower prescore.

a11 = High SES high language lower prescores than other groups.

a12 = High SES minimum time lower prescore than other groups.

d1 = LSES minimum IT and HSES minimum IT had cell n's of 5 and 6 sampling units respectively.

d2 = High skill emphasis low SES has cell n of 6 that is borderline.

d3 = High skill emphasis minimum IT has cell n of 6 that is borderline.

TABLE 16

Summary of Tests of Preconditions for Analyses

of Covariance of Instructional and Pupil Characteristics

on Achievement in Regular Reading Programs

	Grade 2			Grade 6		
	MWK	MREAD	COOP	MWK	MREAD	STEP
PUPIL						
SES	c	c	wxyz	c	a1byz	a4xyz
Sex	c	c	a3xyz	c	wbyz	a3xyz
SES x Sex	c	c	wxyz	c	wbyz	wxyz
INSTRUCTION						
Time	c	c	wxyz	c	wbyz	wxyz
Emphasis	c	c	wxyz	c	wbyz	wxyz
IT x Emphasis	c	c	wxyz	c	wbyz	wxyz
INTERACTION						
IT x SES	c	c	a5xyz	c	a2byz	wxyz
Emphasis x SES	c	c	a6xyz	c	wbyz	wxyz

Note: The code abcd wxyz is same as Table 15.

a1 = HSES higher than MSES higher than LSES on prescores (.001)

a2 = Low SES maximum time have lower prescores and high SES maximum time had higher prescores than other groups

a3 = girls higher than boys (.003)

a4 = HSES higher than MSES higher than LSES (.001)

a5 = Maximum and minimum IT different for high and low SES; they did not differ for middle SES

a6 = Prescores of high and low language emphasis differ for high SES but not middle and low SES

c = other assumptions were not tested due to ceiling effects on this variable

TABLE 17

Analyses of Variance for

Precondition of Equal Populations

	Factors	Program	Grade	Dependent Variable
1.	2(Sex) x 3(SES) x 2(IT) x 2(Emphasis: Skills)	Compensatory	2	Fall MAT Word Knowledge
2.	" " " " "	"	"	Fall MAT Reading
3.	" " " " "	"	"	Fall Cooperative
4.	" " " 2(Emphasis: Lang.)	"	"	Fall MAT Word Knowledge
5.	" " " " "	"	"	Fall MAT Reading
6.	" " " " "	"	"	Fall Cooperative
7.	" " " 2(Emphasis: Skills)	Regular	"	Fall Cooperative
8.	" " " 2(Emphasis: Lang.)	"		Fall Cooperative
9.	" " " 2(Emphasis: Skills)	Compensatory	6	Fall MAT Word Knowledge
10.	" " " " "	"	"	Fall MAT Reading
11.	" " " " "	"	"	Fall Step
12.	" " " 2(Emphasis: Lang.)	"	"	Fall MAT Word Knowledge
13.	" " " " "	"	"	Fall MAT Reading
14.	" " " " "	"	"	Fall Step
15.	" " " 2(Emphasis: Skills)	Regular	"	Fall MAT Reading
16.	" " " " "	"	"	Fall Step
17.	" " " 2(Emphasis: Lang.)	"	"	Fall MAT Reading
18.	" " " " "	"	"	Fall Step

TABLE 18

Percentile Scores on the Cooperative Primary Test
of Second Grade Compensatory Groups
in Different Instructional Conditions

Instructional Time

	MINIMUM			MAXIMUM		
	Fall	Spring	Change	Fall	Spring	Change
Skills Emphasis						
High	30	27	-3	16	19	+3
Low	16	19	+3	16	27	+11

TABLE 19

Percentages of Variance in Reading Achievement Attributable to Instructional and Pupil Characteristics in Compensatory Reading Programs

Source	GRADES 2			GRADES 6		
	MWK	MREAD	COOP	MWK	MREAD	STEP
PUPIL						
SES						
SEX						
INSTRUCTION						
TIME	4					3
EMPHASIS						
IT x EMPHASIS			3			
INTERACTION						
IT x SES				9		8
EMPHASIS x SES		5d				

4 = .01

3 = .03

8 = .01

9 = .005

5d = .02

TABLE 20

Percentile Scores on the Sequential Test of Educational Progress for Sixth Grade Compensatory Groups of Different Instructional Time and SES Categories

	Instructional Time					
	MINIMUM			MAXIMUM		
	Fall	Spring	Change	Fall	Spring	Change
SES						
High	64	67	+3	36	31	-5
Medium	20	24	+4	29	24	-5
Low	18	10	-8	11	8	-3

TABLE 21

Percentile Scores on COOP and STEP in Regular and Compensatory Programs for Grades Two and Six

	Regular			Compensatory		
	Fall	Spring	Change	Fall	Spring	Change
Grade 2	63	48	-15	16	27	+11
Grade 6	50	53	+3	22	21	-1

TABLE 22

Percentile Scores on the STEP for Sixth Grade Regular Programs Under Different Instructional Time and SES Categories

Instructional Time, 6th Grade, Regular

	Minimum			Maximum		
	Fall	Spring	Change	Fall	Spring	Change
SES						
High	53	56	+3	59	60	+1
Medium	53	53	-0	50	53	+3
Low	47	53	+6	44	33	-11

TABLE 23

Percentages of Variance in Reading Achievement Attributable to Instructional and Pupil Characteristics in Regular Reading Programs

	Grade 2			Grade 6		
Source	MWK	MREAD	COOP	MWK	MREAD	STEP
Pupil						
SES	*	*		*		
SEX	*	*		*	1	
SEX x SES	*	*		*		1
Instruction						
Time	*	*		*		
Emphasis	*	*		*		
IT x Emphasis	*	*		*		1
Interaction						
IT x SES	*	*		*	1a	3
Emphasis x SES	*	*		*	2	

1 = .04, .03, .03

1a = .02

2 = .009

3 = .001

* = Not tested due to ceiling effects

TABLE 24

Raw and Percentile Scores of Regular and Compensatory Children Combined for Boys and Girls at Grades Two and Six on COOP and STEP Respectively

Pupil Characteristics		Grade 2 (N=483) Percentile	$\bar{x}$	SD	Grade 6 (N=448) Percentile	$\bar{x}$	SD
Sex	Boys	(50)	25.59	8.66	(42)	35.77	9.56
	Girls	(50)	27.47	9.00	(47)	38.32	8.37
SES	High	(63)	28.83	10.05	(56)	40.85	7.25
	Middle	(50)	27.17	8.05	(44)	37.24	8.51
	Low	(30)	23.94	9.12	(31)	31.81	9.98

TABLE 25

Grade Level Means of Compensatory Readers on the Fall Metropolitan Achievement Test for Different Grade Levels and SES Groups

		Grade 2	Grade 6
WORD KNOWLEDGE	HSES	1.4	5.0
	MSES	1.7	3.9
	LSES	1.6	3.3
	$\bar{x}$	1.56	4.1
READING	HSES	1.6	5.1
	MSES	1.7	3.9
	LSES	1.6	3.0
	$\bar{x}$	1.63	4.0

TABLE 26

Learning Rates of Compensatory Readers on Metropolitan Achievement Tests for Different Grade and SES Groups

		Grade 2	Grade 6
WORD KNOWLEDGE	HSES	.4	.8
	MSES	.7	.6
	LSES	.6	.5
	$\bar{x}$	.56	.63
READING	HSES	.6	.8
	MSES	.7	.6
	LSES	.6	.4
	$\bar{x}$	.63	.60

TABLE 27

Frequencies of Children in Word Recognition and Comprehension Levels Among Compensatory Readers at Grade Two

COMPREHENSION		WORD RECOGNITION LOW	MIDDLE	HIGH
LOW	N	100	132	3
	Tot.%	5.1%	6.7%	.1%
MIDDLE	N	307	950	132
	Tot.%	15.6%	48.3%	6.7%
HIGH	N	2	37	305
	Tot.%	.1%	1.9%	15.5%

Note: The total % of 5.1 is the proportion represented by 100 children of the total of 1968.

TABLE 28

Frequencies of Children in Word Recognition and Comprehension Levels Among Compensatory Readers at Grade Six

COMPREHENSION		WORD RECOGNITION: LOW	WORD RECOGNITION: MIDDLE	WORD RECOGNITION: HIGH
LOW	N	215	106	1
	Tot.%	13.8%	6.8%	.1%
MIDDLE	N	107	707	71
	Tot.%	6.9%	45.4%	4.6%
HIGH	N	0	96	255
	Tot.%	0	6.2%	16.4%

TABLE 29

Types of Reading Problems Among Children

From Compensatory Reading Programs

	GRADE	
	2	6
Word Recognition Deficit	17.6%	13.1%
Comprehension Deficit	13.5%	11.4%
Comparable Scores	68.9%	75.5%
Total	100.0%	100.0%